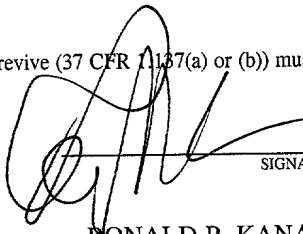


PCT

526 Rec'd PCT/PTC 12 JUL 2000

<b>TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371</b>		<b>ATTORNEY'S DOCKET NUMBER SON-1716/TSU</b>
		<b>U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.53)</b> <b>09/600139</b>
<b>INTERNATIONAL APPLICATION NO. PCT/JP99/06315</b>	<b>INTERNATIONAL FILING DATE 12 November 1999</b>	<b>PRIORITY DATE CLAIMED 13 November 1998</b>
<b>TITLE OF INVENTION COLOR CATHODE RAY TUBE AND METHOD OF MANUFACTURING THE SAME</b>		
<b>APPLICANT(S) FOR DO/EO/US Kimiyo IBARAKI</b>		
<p>Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:</p> <ol style="list-style-type: none"><li>1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371.</li><li>2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371.</li><li>3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(I).</li><li>4. <input type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.</li><li>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)<ol style="list-style-type: none"><li>a. <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau).</li><li>b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau</li><li>c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</li></ol></li><li>6. <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)).</li><li>7. <input type="checkbox"/> Amendment to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).<ol style="list-style-type: none"><li>a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).</li><li>b. <input type="checkbox"/> have been transmitted by the International Bureau.</li><li>c. <input type="checkbox"/> have not been made; however, the time limit for making such amendment has NOT expired.</li><li>d. <input checked="" type="checkbox"/> have not been made and will not be made.</li></ol></li><li>8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</li><li>9. <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).</li><li>10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</li></ol> <p>Items 11 to 16 below concern either document(s) or information included:</p> <ol style="list-style-type: none"><li>11. <input type="checkbox"/> In Information Disclosure Statement under 37 CFR 1.97 and 1.98.</li><li>12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</li><li>13. <input type="checkbox"/> A <b>FIRST</b> preliminary amendment. <input type="checkbox"/> A <b>SECOND</b> or <b>SUBSEQUENT</b> preliminary amendment.</li><li>14. <input type="checkbox"/> A substitute specification.</li><li>15. <input type="checkbox"/> A change of power of attorney and/or address letter.</li><li>16. <input type="checkbox"/> Other items or information.</li></ol>		

U.S. APPLICATION NO. <b>09/600139</b>		INTERNATIONAL APPLICATION NO. <b>PCT/JP99/06315</b>		ATTORNEY'S DOCKET NUMBER <b>Son-1716/tsu</b>	
17. <input checked="" type="checkbox"/> The following fees are submitted:  <b>Basic National Fee (37 CFR 1.49(a)(1)-(5):</b> Search Report has been prepared by the EPO or JPO.....  International preliminary examination fee paid to USPTO (37 CFR 1.482)..... No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)).....  Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO.....  International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4).....  <div style="text-align: right;"><b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b></div>				CALCULATIONS	PTO USE ONLY
				<b>\$840.00</b>	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.49(e)).				\$	
Claims	Number Filled	Number Extra	Rate		
Total Claims	6-20 =	0	X \$22	\$	
Independent Claims	2-3 =	0	X \$78	\$	
Multiple dependent claim(s) (if applicable)			+ \$250	\$	
<b>TOTAL OF ABOVE CALCULATIONS</b>				=	<b>\$ 840.00</b>
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28)				\$	
<b>SUBTOTAL</b>				=	<b>\$ 840.00</b>
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.49(f)).				+	\$
<b>TOTAL NATIONAL FEE</b>				=	<b>\$ 840.00</b>
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate sheet (37 CFR 3.28, 3.31). \$40.00 per property				+	<b>\$ 0.00</b>
<b>TOTAL FEES ENCLOSED</b>				=	<b>\$ 840.00</b>
				Amount to be refunded.	\$
				charged:	<b>\$ 840.00</b>
a. <input type="checkbox"/> A check in the amount of \$_____ to cover the above fees is enclosed. b. <input checked="" type="checkbox"/> Please charge my Deposit Account No. <u>18-0013</u> in the amount of <u>\$ 840.00</u> to cover the above fees. A duplicate of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>18-0013</u> . A duplicate copy of this sheet is enclosed.					
<b>NOTE:</b> Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO: Ronald P. Kananen, Esq. Rader, Fishman & Grauer, L.P.P.C. 1233 20 <sup>th</sup> Street, N.W., Suite 501 Washington, DC 20036 Dated: July 12, 2000					
 SIGNATURE <b>RONALD P. KANANEN</b>					NAME <b>24,104</b> REGISTRATION NUMBER

09/600139

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## DESCRIPTION

# Color cathode-ray Tube and Method of Manufacturing the Same

## Technical Field

The present invention relates to a color cathode-ray tube having conductive reflecting films on the phosphor screen of the inner surface of a panel and a color selection electrode, and a method of manufacturing the same.

## Background Art

Fig. 1 shows a panel for a color cathode-ray tube. A phosphor screen 12 comprised of red, green and blue phosphor stripes and carbon films filling gaps among them is formed on the inner surface of a panel 11. Electron beams (not shown) are selectively landed on the phosphor stripes of predetermined colors of the phosphor screen 12 through a color selection electrode (not shown) to display a color image.

In order to reflect light, emerging from the phosphor screen 12 toward an electron gun (not shown), toward the panel 11 so as to increase the brightness, and to stabilize the potential of the phosphor screen 12, a conductive reflecting film 13 called a metal

back, which is made of aluminum having a high light reflectance and electron transmittance, is formed on the phosphor screen 12.

The conductive reflecting film 13 made of aluminum also has high heat reflectance. If the conductive reflecting film 13 is exposed, heat radiated by the color selection electrode heated by bombardment of an electron beam is reflected by the conductive reflecting film 13 to further heat the color selection electrode.

When the color selection electrode is heated and thermally expands, the correspondence relationship between the color selection electrode and phosphor stripes fluctuates, and the electron beam is landed on an incorrect portion of the phosphor screen 12 to decrease the color purity. For this reason, conventionally, a heat absorbing film 14 is formed on the conductive reflecting film 13. Heat radiated from the color selection electrode is absorbed by the heat absorbing film 14. Heat reflection and radiation from the conductive reflecting film 13 to the color selection electrode are suppressed, thereby suppressing thermal expansion of the color selection electrode.

In a method of manufacturing a color cathode-ray tube having such a heat absorbing film 14 according to the first related art, a conductive reflecting film

13 is formed on a phosphor screen 12 by vapor deposition of aluminum in a vacuum of about  $10^{-2}$  to  $10^{-3}$  Pa ( $10^{-4}$  to  $10^{-5}$  Torr). After that, a black aluminum film serving as the heat absorbing film 14 is formed by vapor deposition of aluminum in a vacuum of 10 to 1 Pa ( $10^{-1}$  to  $10^{-2}$  Torr) (Japanese Patent Publication No. 6247341).

In the second related art, a black aluminum film to serve as a heat absorbing film 14 is formed on a conductive reflecting film 13 by vacuum deposition using a mixed pellet of manganese and aluminum (Japanese Patent Publication No. 718001). In the third related art, a solution obtained by dissolving carbon in an organic solvent is sprayed to form a carbon film serving as a heat absorbing film 14 on a conductive reflecting film 13 (Japanese Patent Publication No. 5847813).

In the first related art described above, the vacuum degree in an evaporation system must be changed between formation of the conductive reflecting film 13 and formation of the heat absorbing film 14. A desired vacuum degree cannot be precisely obtained, or oil in the exhaust pump may be oxidized, leading to variations in thickness and quality of the heat absorbing film 14. Therefore, heat reflection and radiation from the conductive reflecting film 13 to the color selection

electrode cannot be suppressed effectively, and mislanding of the electron beam onto the phosphor screen 12 due to thermal expansion of the color selection electrode is difficult to suppress, making it difficult to manufacture a color cathode-ray tube in which a decrease in color purity is small.

In the second related art, the start time of vapor deposition of manganese differs from that of aluminum. It is difficult to form the heat absorbing film 14 having a desired quality, and accordingly it is difficult to manufacture a color cathode-ray tube in which a decrease in color purity is small. In the third related art, the carbon film serving as the heat absorbing film 14 tends to separate easily due to its low adhesion properties, and has large gas absorption properties. Nonuniformity occurs in the image quality, and the cathode of the electron gun is damaged by a decrease in vacuum degree in the color cathode-ray tube. Therefore, it is difficult to manufacture a color cathode-ray tube having a uniform image quality and a long service life.

It is, therefore, an object of the present invention to provide a color cathode-ray tube in which variations in thickness and quality of a heat absorbing film on a conductive reflecting film are small so that a decrease in color purity is small, and a method of

manufacturing the same.

#### Disclosure of Invention

With a color cathode-ray tube and a method of manufacturing the same according to the present invention, a sol containing a material, which is to form an oxide, in a colloidal state is applied and baked to form a heat absorbing film made of the oxide on a conductive reflecting film. The conductive reflecting film is generally formed by vacuum deposition. Namely, a method of forming the conductive reflecting film and a method of forming the heat absorbing film are different from each other, and a vacuum evaporation system for forming the conductive reflecting film and an applying/baking system for forming the heat absorbing film are two different systems.

Therefore, conditions under which these systems are operated need not be changed, and a heat absorbing film having small variations in thickness and quality can be formed on the conductive reflecting film. Reflection and radiation of heat from the conductive reflecting film to a color selection electrode are suppressed effectively, and mislanding of an electron beam onto a phosphor screen caused by thermal expansion of the color selection electrode is

suppressed, so that a color cathode-ray tube in which a decrease in color purity is small can be manufactured.

As the material to form the oxide, if at least one member selected from a group consisting of silicon, manganese, aluminum and tin antimonide is used, a heat absorbing film, having large adhesion properties to prevent easy separation, and small gas absorption properties, can be formed on the conductive reflecting film. Therefore, nonuniformity does not occur easily in the image quality, and the cathode of the electron gun is not easily damaged by a decrease in vacuum degree in the color cathode-ray tube. Therefore, a color cathode-ray tube having a uniform image quality and a long service life can be manufactured.

When a sol dispersed with fine carbon powder is used, a heat absorbing film having a high heat absorption effect can be formed. Then, mislanding of the electron beam to the phosphorus surface caused by thermal expansion of the color selection electrode is suppressed further effectively, so that a color cathode-ray tube in which a decrease in color purity is further small can be manufactured.

#### Brief Description of Drawing

Fig. 1 is a side sectional view of a panel to



which the present invention can be applied.

#### Best Mode for Carrying Out the Invention

An embodiment of the present invention will be described with reference to Fig. 1. In this embodiment, in a panel 11, an organic intermediate film (not shown) is formed on the surface of a phosphor screen 12 to smooth the surface of the phosphor screen 12. This panel 11 is placed on the base of a vacuum evaporation system, and aluminum as the material of a conductive reflecting film 13 is set on the heater of the vacuum evaporation system. The interior of the vacuum evaporation system is evacuated by an oil rotation pump and an oil diffusion pump.

When the interior of the vacuum evaporation system reaches a vacuum degree of about  $10^{-2}$  to  $10^{-3}$  Pa ( $10^{-4}$  to  $10^{-5}$  Torr), power is supplied to the heater to deposit aluminum by heat vapor deposition, thereby forming the conductive reflecting film 13 on the phosphor screen 12. In this vacuum vapor deposition, the conductive reflecting film 13 having a uniform thickness can be formed, and the conductive reflecting film 13 can be formed within a short period of time, i.e., at a low cost. After that, the panel 11 is held at a temperature equal to or more than ordinary temperature in a heating furnace.



selected from other materials as far as it can form the heat absorbing film 14 with an oxide. In the above embodiment, the sol is generated by hydrolysis of an alkoxide. However, the sol can be generated by other methods:

#### Industrial Applicability

The present invention can be utilized in the manufacture of a color cathode-ray tube by applying it to formation of a heat absorbing film onto a conductive reflecting film on the phosphor screen on the inner surface of the panel.

## C L A I M S

1. A method of manufacturing a color cathode-ray tube, comprising the steps of:

applying a sol containing a material, which is to form an oxide, in a colloidal state on a conductive reflecting film on a phosphor screen of an inner surface of a panel; and

baking the sol to form a heat absorbing film made of the oxide on said conductive reflecting film.

2. A method of manufacturing a color cathode-ray tube according to claim 1, wherein at least one member selected from a group consisting of silicon, manganese, aluminum and tin antimonide is used as the material.

3. A method of manufacturing a color cathode-ray tube according to claim 2, wherein the sol dispersed with fine carbon powder is used.

4. A color cathode-ray tube in which a heat absorbing film made of an oxide is formed on a conductive reflecting film on a phosphor screen of an inner surface of a panel by applying and baking a sol containing a material, which is to form the oxide, in a colloidal state.

5. A color cathode-ray tube according to claim 4, wherein the material is at least one member selected from a group consisting of silicon, manganese,

aluminum and tin antimonide.

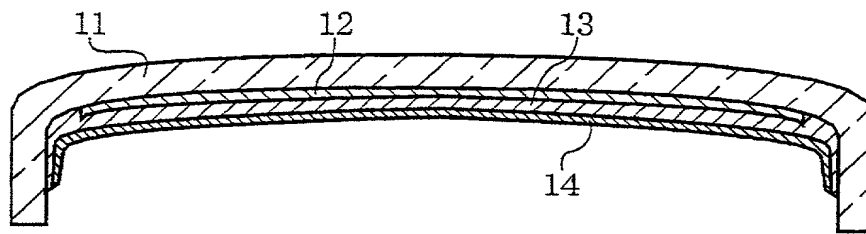
6. A color cathode-ray tube according to claim 5, wherein the sol is dispersed with the fine carbon powder.

# A B S T R A C T

A heat absorbing film (14) made of an oxide is formed on a conductive reflecting film (13) by applying and baking a sol containing a material, which is to form the oxide, in a colloidal state. Conditions under which a vacuum evaporation system for forming the conductive reflecting film (13), and an applying/baking system for forming the heat absorbing film (14) are operated need not be changed, and the heat absorbing film (14) having small variations in thickness and quality can be formed on the conductive reflecting film (13). Reflection and radiation of heat from the conductive reflecting film (13) to a color selection electrode are suppressed effectively, so that a color cathode-ray tube in which a decrease in color purity is small can be manufactured.

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**FIG. 1**



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<b>DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION</b>		<b>Attorney Docket No.</b>		SON-1716/TSU																																											
		<b>First Named Inventor</b>																																													
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<p>As a below named inventor, I hereby declare that:</p> <p>My residence, post office address, and citizenship are as stated below next to my name.</p> <p>I believe I am the original, first and sole inventor (only if one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:</p> <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px auto; width: 80%;"> <b>COLOR CATHODE-RAY TUBE AND METHOD OF MANUFACTURING THE SAME</b> </div> <p style="text-align: center;"><i>(Title of the Invention)</i></p> <p>the specification of which</p> <p><input type="checkbox"/> is attached hereto</p> <p style="padding-left: 20px;">or</p> <p><input checked="" type="checkbox"/> was filed on November 12, 1999 as United States Application Number or PCT International Application Number: <u>PCT/JP99/06315</u> and was amended on _____ (if applicable).</p> <p>I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.</p> <p>I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations § 1.56.</p> <p>I hereby claim foreign priority benefits under Title 35, United States Code §119 (a)-(d) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Prior Foreign Application Number(s)</th> <th rowspan="2">Country</th> <th rowspan="2">Foreign Filing Date (MM/DD/YY)</th> <th rowspan="2">Priority Claimed</th> <th colspan="2">Certified Copy Attached</th> </tr> <tr> <th>YES</th> <th>NO</th> </tr> </thead> <tbody> <tr> <td>10-323462</td> <td>JAPAN</td> <td>11/13/98</td> <td>yes</td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </tbody> </table> <p><input type="checkbox"/> Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:</p> <p>I hereby claim the benefit under Title 35, United States Code §119(e) of any United States provisional application(s) listed below.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Application Number (s)</th> <th>Filing Date (MM/DD/YY)</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table> <div style="margin-top: 10px;"> <input type="checkbox"/> Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.     </div>						Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YY)	Priority Claimed	Certified Copy Attached		YES	NO	10-323462	JAPAN	11/13/98	yes	<input type="checkbox"/>	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>	Application Number (s)	Filing Date (MM/DD/YY)														
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### DECLARATION - Utility Or Design Patent Application

I hereby claim the benefit under Title 35, United States Code §120 of any United States application(s) of any PCT International application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the matter provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S Parent Application Number	PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

☐ Additional U.S. or PCT international application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto

As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: ☐ Customer Number

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☒ Registered practitioner(s) name/registration number listed below

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Name	Registration Number	Name	Registration Number
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H. Lawrence Smith	24,900	Richard D. Grauer	22,388
Ralph T. Rader	28,772	Michael D. Fishman	31,951
Joseph V. Coppola, Sr.	33,373	Mark A. Davis	37,118
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Ronald P. Kananen	24,104	David K. Benson	42,314
Matthew J. Russo	41,282	Christopher M. Tanner	41,518
G. Thomas Williams	42,228	Robert S. Green	41,800

☐ Additional registered practitioner(s) named on supplemental Registered Practitioner Information sheet PTO/SB/02C attached hereto.

Direct all correspondence to ☒ Customer Number 23353 or ☐ Correspondence Address below  
or Bar Code Label

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Country	US	Telephone	202-955-3750
		Fax	202-955-3751

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor		<input type="checkbox"/> A petition has been filed for this unsigned inventor	
Given Name (first and middle [if any])		Family Name or Surname	
Kimiyo		Ibaraki	
Inventor's Signature	Kimiyo Ibaraki		Dated August 23, 2000
Residence: City	State	Country	Citizenship
Post Office Address	c/o SONY INAZAWA CORPORATION, 30 Ibarashima, Ohya-cho		
City	Inazawa	State	Aichi
		Zip	492-8412
		Country	Japan

☐ Additional inventors are being named on the supplemental additional inventor(s) sheet(s) PTO/SB/02A attached hereto.

Name of Inventor		<input type="checkbox"/> A petition has been filed for this unsigned inventor	
Given Name (first and middle [if any])		Family Name or Surname	
Inventor's Signature			Dated
Residence: City	State	Country	Citizenship
Post Office Address			
City	State	Zip	Country